Kennedy

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546

November 19, 1970

REPLY TO
ATTN OF: GP

TO: USI/Scientific & Technical Information Division
Attention: Miss Winnie M. Morgan

FROM: GP/Office of Assistant General Counsel for
Patent Matters

SUBJECT: Announcement of NASA-Owned U. S. Patents in STAR

In accordance with the procedures agreed upon by Code GP and Code USI, the attached NASA-owned U. S. Patent is being forwarded for abstracting and announcement in NASA STAR.

The following information is provided:

U. S. Patent No. : 3,526,897

Government or
Corporate Employee : U.S. Government

Supplementary Corporate
Source (if applicable) : NA

NASA Patent Case No. : XKS-09348

NOTE - If this patent covers an invention made by a corporate employee of a NASA Contractor, the following is applicable:

Yes ☐ No ☒

Pursuant to Section 305(a) of the National Aeronautics and Space Act, the name of the Administrator of NASA appears on the first page of the patent; however, the name of the actual inventor (author) appears at the heading of Column No. 1 of the Specification, following the words ". . . with respect to an invention of . . . "

Elizabeth A. Carter

Enclosure
Copy of Patent cited above

COSATI 09E

NN-13521

Sept. 1, 1970 H. E. CRIBB 3,526,897

PARASITIC PROBE ANTENNA

Filed Oct. 20, 1967

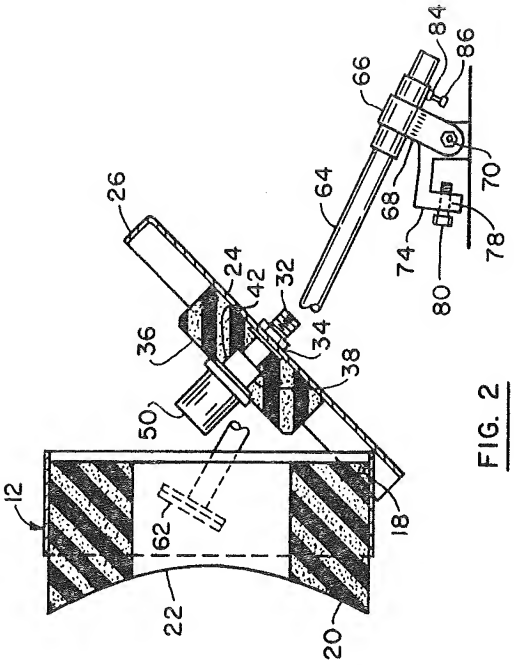

FIG. 2

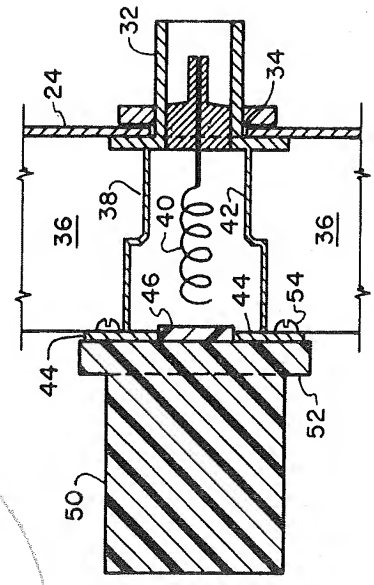

FIG. 3

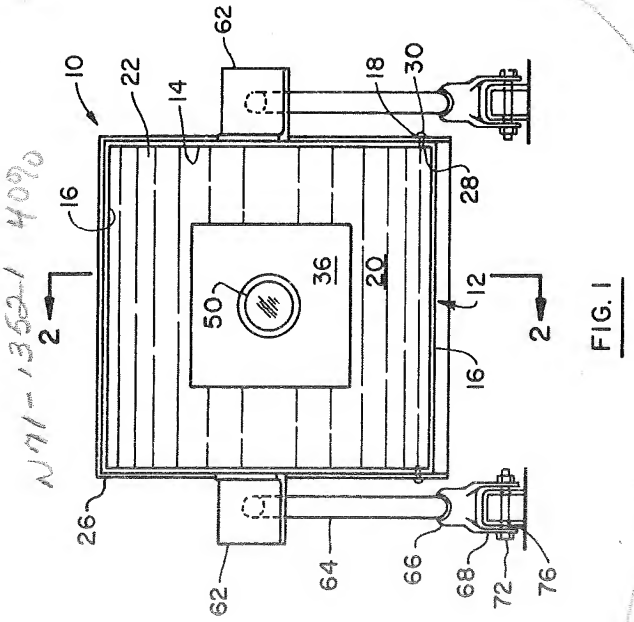

FIG. 1

NN-13521 40%

HERBERT E. CRIBB
INVENTOR.

BY Thomas & Cory
William H. King
ATTORNEYS

854

United States Patent Office 3,526,897 Patented Sept. 1, 1970

3,526,897

PARASITIC PROBE ANTENNA

Herbert E. Cribb, Satellite Beach, Fla., assignor to the United States of America as represented by the Administrator of the National Aeronautics and Space Administration

Filed Oct. 20, 1967, Ser. No. 677,505
Int. Cl. G01r; H01q 13/00, 1/42
U.S. Cl. 343—703 5 Claims

ABSTRACT OF THE DISCLOSURE

This invention relates to a parasitic probe having low insertion losses and requiring less power to be used by interrogating radar. A housing interiorly lined with RF absorbent material is adapted for mounting adjacent the spacecraft antenna. A spacecraft type helix antenna is mounted on the pivotal back plate of the housing with a conventional RF fitting to permit connection to external antennas. A polystyrene rod is affixed to the face of the helix antenna to establish a low loss path for electromagnetic waves flowing from the spacecraft antenna to the helix antenna. The housing construction and its location for operation provide a protective cover for the spacecraft antenna with the RF absorbent lining preventing stray radiation from reaching the interrogating radar.

The invention described herein was made by an employee of the United States Government and may be manufactured and used by or for the Government for governmental purposes without payment of any royalties thereon or therefor.

This invention relates generally to a parasitic probe antenna and more particularly to a low loss "C" band parasitic probe antenna.

Prelaunch test procedures for spacecraft and boosters necessarily require that all systems and equipment be completely tested for operational reliability prior to launch of the vehicle. In order to insure complete testing, the spacecraft must be isolated and the antennas thereof energized for transmission of radio frequency (RF, hereinafter) energy from the spacecraft or booster. Previously utilized devices for monitoring the signal transmitted from the spacecraft antenna generally were of a hat arrangement. These devices provided a marginal signal to the interrogating radar and the monitoring facilities. Moreover, the previous devices had high insertion losses and the spacecraft beacon reply was weak and marginal. Thus requiring the interrogating radar to use higher power to interrogate the spacecraft beacons.

In order to overcome the disadvantages of the prior art, the instant invention contemplates a housing lined on the interior with an RF absorbent material. A spacecraft type helix antenna is mounted centrally of the back of the housing and is connected with a conventional RF connector for attachment to a cable leading to external antennas. A polystyrene rod is mounted over the helix antenna and directed toward the spacecraft antenna to establish a low loss path for the electromagnetic waves to reduce insertion losses and provide a protective cover for the spacecraft antenna.

Accordingly, it is an object of the instant invention to provide a device for efficiently coupling RF energy from a spacecraft on the launch pad to outside antennas for prelaunch testing.

Another object of this invention is to provide a parasitic probe for prelaunch testing and protection of spacecraft antennas.

Still another object of the instant invention is to provide a housing lined with RF absorbent material and having a rod attached to the face of a spacecraft type helix antenna mounted in the housing and having a connector for a cable leading to external antennas.

A still further object of this invention is to provide a low loss "C" band parasitic probe having a housing interiorly lined with RF absorbent material and having a pivotal back plate with a cavity in the lining thereon for receiving a spacecraft type helix antenna to the face of which a polystyrene rod is attached to establish a low loss path for electromagnetic waves.

A more complete appreciation of the invention and many of the attendant advantages thereof will be readily apparent as the same becomes better understood by reference to the following description when considered in connection with the accompanying drawings wherein:

FIG. 1 is a front elevational view of the instant invention;

FIG. 2 is a sectional view taken on line 2—2 of FIG. 1 with a portion of the invention in an alternative position; and

FIG. 3 is an enlarged sectional view of a portion of the instant invention.

Referring now to the drawings, and more particularly to FIGS. 1 and 2, wherein the instant inventive parasitic probe generally designated by numeral **10** is shown to include a rectangular frame or housing **12** having sides **14** and top and bottom **16**. Sides **14** have apertures **18** located in a spaced relationship to the rearward bottom corner for a purpose to be more fully understood hereinafter.

The interior of housing **12** is covered with lining **20** of an RF absorbent material such as Eccosorb, AN–77, produced by Emerson-Cumming Company, which is a lightweight, flexible foam sheet, broadband microwave absorber. Lining **20** is adhesively secured to the inner sides of housing **12** and extends outwardly beyond the front edges of top and bottom **16** and has vertically arcuate sides **22** which assist in preventing stray radiation from the spacecraft antenna, not shown, as well as forming a protective cover for the spacecraft antenna.

Back plate **24** has flange **26** extending from the top and sides and is dimensioned to fit around the respective portions of housing **12**. Apertures **28** are located in the lower portion of the sides of flange **26**. Pivot bolt **30** extends through apertures **18** and **28** to pivotally secure back plate **24** to sides **14** of housing **12**.

Aperture **34** is substantially centrally located in back plate **24** for attachment of conventional RF fitting **32** to permit a cable, not shown, leading to external antennas to be easily connected to parasitic probe **10**. Lining section **36** also is made of RF absorbent material and is substantially rectangular to fit within lining **20** when back plate **24** is in the closed position. Cavity **38** extends through the center of lining section **36** to receive cup member **42**. Spacecraft type helix antenna **40** is mounted in cup member **42** and is connected to RF fitting **32** to provide a path for the electromagnetic waves. Cover **44** extends beyond the sides of cup member **42** and has polystyrene center **46** inserted therein over helix antenna **40**.

Polystyrene rod **50** has an attachment flange **52** extending outwardly therefrom at one end. Flange **52** is of greater diameter than center **46** and is secured to cover **44** by bolts or screws **54** and a conventional polystyrene adhesive. Rod **50** acts as an end-fire antenna and a guide for electromagnetic waves emitted from the spacecraft antenna, not shown. Since rod **50** is secured against center **46**, there is a low loss path for the "C" band RF energy from the spacecraft antenna through rod **50** and center **46** to helix antenna **40**, and, therefore,

to RF fitting 32. Such an arrangement insures low insertion losses and the attendant advantages thereof.

Parasitic probe 10 is preferably constructed to be mounted on the gantry or framework surrounding the spacecraft. In order to accomplish such a mounting, brackets 62 are affixed to the exterior of sides 14 of housing 12 and may be angularly disposed if necessary for proper location of probe 10. Arms 64 are rigidly attached at one end to brackets 62 and extend rearwardly and downwardly from housing 12. Tubular brackets 66 fit over the other end of arms 64 and have flanges 68 extending downwardly to receive U-shaped clamp member 74. Flanges 68 have horizontal apertures 70 for receiving bolts 72 that pivotally mount clamp member 74 between flanges 68. Clamp member 74 is shaped to fit over a flange or other support, not shown, on the gantry structure and has aperture 76 in one leg to permit insertion of bolts 72. Threaded bore 78 extends through the other leg of clamp member 74 perpedicular to aperture 76 and receives set screw 80 for securing clamp member 74, and thus tubular bracket 66, on the gantry structure.

It is to be understood that tubular bracket 66 may be provided with boss 84 having threaded bore (not shown) for receiving set screw 86 to permit secure attachment of tubular brackets 66 on arms 64.

The above description of the instant invention indicates the advantages of this device in permitting the interrogating radar to use less signal which reduces the ground clutter and strengthens the reply from the spacecraft beacon. The RF absorbent material provides low insertion losses, as well as a protective cover for the spacecraft antenna which requires no physical attachment of the parasitic probe to the spacecraft.

Obviously, many modifications and variations of the subject invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A parasitic probe for receiving a signal from a spacecraft antenna comprising:
(A) a substantially rectangular frame having a top, bottom and sides;
(B) a back plate pivotally mounted on said sides;
(C) antenna means secured to said back plate;
(D) connector means attached to said antenna means for connecting said antenna means with external antennas;

(E) lining means on said rectangular frame; and
(F) rod means disposed between said antenna means and said spacecraft antenna, whereby said spacecraft antenna is protected and stray radiation is prevented from reaching said spacecraft antenna to provide a very low loss RF coupling from said spacecraft antenna to said external antennas.

2. The parasitic probe of claim 1 wherein:
(A) said antenna means comprises a spacecraft type helix antenna enclosed in a cup member; and
(B) said cup member having a cover with a polystyrene center.

3. The parasitic probe of claim 1 wherein:
(A) said lining means is made of an RF absorbent material;
(B) said absorbent material covers the interior of said rectangular frame; and
(C) a section of said absorbent material is mounted on said back plate and has a cavity therein for receiving and surrounding said antenna means.

4. The parasitic probe of claim 1 wherein:
(A) an adjustable mounting support is attached to said back plate; and
(B) said back plate is adapted to be pivoted from a position closing the back of said rectangular frame to an open position to provide access to the side of said back plate facing the interior of said rectangular frame.

5. The parasitic probe of claim 2 wherein:
(A) said cover extends outwardly beyond the edge of said cup member to form a flange;
(B) said rod means being a substantially cylindrical polystyrene dowel forming an end-fire antenna; and
(C) said dowel having an outwardly extending flange on one end for attachment to said flange on said cover.

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HERMAN KARL SAALBACH, Primary Examiner

T. J. VEZEAU, Assistant Examiner

U.S. Cl. X.R.

343—705, 785, 833, 851, 872, 895